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THE 1918 GRAIN CROP

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This circular has been prepared not to explain how a farmer can make the greatest profit during the present crisis, but to discuss how maximum production may be obtained without loss of the usual income.

One of the requirements for increasing the production of food is capital. The most effective capital is the profit which farmers have obtained from a previous crop. Whenever a farmer finds himself with a surplus of \$500 or \$5000, his almost invariable procedure is to reinvest that money in increasing his business, in improving his property, or in furnishing his home. Under existing conditions he may as a patriotic citizen be depended upon to extend his business.

An investigation has shown that canals and principal laterals are already constructed to irrigate a half-million more acres of land in California than are being irrigated in 1917. This land cannot be brought under cultivation without an investment of capital. The most effective capital for bringing much of this area under irrigation is the profit which the farmer will obtain from the 1917 crop. He understands better than anyone else how to use this capital. Unless the capital in the hands of the farmer increases he is not apt to increase production to any great degree, not because he does not want to do so but because he can not. The general desire of the farmer is to extend his operations, even in times of peace, but when prices are low and when perhaps he must mortgage the farm to pay his taxes he finds it impossible to do so. Probably the California farmer will receive more for his 1917 crop than he has received for any previous crop. Hence a considerable increase in the 1918 crop may be confidently expected.

What should be the price of any commodity? Obviously, it should be sufficient to cause its production. Just at present wheat should bring such a price as to cause its maximum production. Can

this price be determined? The United States is a large and varied country. Hence there is danger in trying to make statements of general application. It is possible, however, to give concrete examples that may have local application. Under average soil and climatic conditions forty bushels or twenty cents of barley is considered a satisfactory yield in California. An equally satisfactory yield of wheat is twenty bushels or twelve cents per acre. The cost of producing either crop being substantially equal, in order to secure the sowing of wheat in place of barley the gross return from an acre of wheat should be at least equal to that from an acre of barley. If barley is worth \$2 per cental or \$1 per bushel, it would be necessary that wheat should bring \$3.33 per cental or \$2 per bushel. Last winter when barley was selling at \$60 per ton wheat was not too high at \$5 per cental or \$3 per bushel from the standpoint of inducing future production.

These comparisons have application only in those sections of the state where soil and climatic conditions are such as to make these two crops practically interchangeable. There are some, perhaps considerable, portions of the state where barley is a safer risk through a series of years. Under such circumstances the relative price of wheat must be increased to make it an economically desirable crop. In other portions of the state where the relative yield of wheat is greater, a smaller price should be necessary to promote its production.

As an illustration, at the University Farm at Davis, under the biennial dry-farming system the average yield of seven crops of White Australian (Oregon Blue-stem) wheat, 1908-14 inclusive, was 43.53 bushels or 26.11 cents per acre, while the corresponding average for Common California (Bay Brewing, or Coast) barley under like conditions was 83.46 bushels or 41.73 cents. Under these conditions when barley is worth \$1 per bushel or \$2 per cental, it would be necessary for wheat to bring \$1.92 per bushel or \$3.20 per cental to make the same gross return per acre. A further example may be found in the average yield of wheat in California for the decade ending 1915, which was 16.01 bushels or 9.61 cents per acre, while the average yield of barley for the same period was 28 bushels or 14 cents per acre. With barley at \$2 per hundred pounds wheat should be worth \$2.92 per cental or \$1.75 per bushel.

Obviously, as the price of barley falls, a lower price for wheat will be sufficient to cause it to be planted. What then are the factors which influence the price of barley? Discussion is here limited to the standpoint of its value as a food for domestic animals.

There are three crops in the United States that are more or less interchangeable. The average annual production in the United States for the decade ending December, 1916 has been as follows:

	Bushels
Indian Corn	2,705,348,000
Oats	1,115,956,800
Barley	183,451,300

The average December farm price of these three crops for the same decade has been :

	Bushels	Centals
Indian Corn	\$.609	\$1.09
Oats415	1.30
Barley619	1.24

It is wholly possible, and indeed quite probable, that the United States will produce this year the largest crop of Indian corn in its history. The yields of oats and barley may be above normal. Since it is the net deficit or the net surplus that causes the great fluctuations in prices, the question arises as to whether a considerable decrease in price may not be anticipated when these three great crops, or at least the greatest of the three, Indian corn, begins to find its way to market.

Without passing any opinion upon the future prices of these products a number of factors involved may be stated. Their aggregate exportation is fairly considerable, but it constitutes a relatively small portion of the total. The prices are therefore largely a domestic matter. Chicago, and not Liverpool, controls the price of these commodities.¹

In passing it may be stated that this is a factor in their favor, since they will not be as violently affected by foreign conditions, nor as likely to be influenced by governmental regulations.

It requires about 500 pounds of Indian corn or an equal amount of barley meal to produce 100 pounds of growth in hogs. Hence, when hogs are worth five cents a pound, either food will return one cent a pound when fed to them; if hogs are worth ten cents, two cents will be returned per pound of food; and if fifteen cents, as at present, three cents will be returned per pound. Under the conditions named, a farmer would not be justified in buying barley meal at three cents a pound or \$60 a ton to feed to hogs because he is entitled to some return for the capital invested, and for the labor and the risks incurred from cholera and other causes, unless it is thereby possible to make use also of cheaper foods such as alfalfa pasture. It is evident, however, that as long as hogs are fifteen cents a pound or higher, corn and barley must have some rather definite relation to that fact.

¹ This statement is wholly unscientific, but represents the popular conception. It is perhaps more accurate to say that Chicago, and not Liverpool, offers the best evidence of the demand.

The factors affecting the price of pork are important therefore in determining the price of Indian corn and of barley and hence the acreage of the 1918 crop of wheat.²

Aside from the general rise in prices due to the increase per capita of money and instruments of credit, the chief factors in the increased price of pork are due to:

1. Augmented foreign demands for pork products, including lard.
2. Increased cost of production.

The increased cost of production is due partly to the increased price of Indian corn and barley. The increased price of Indian corn and barley is due in part to the increased value of pork. Each reacts on the other. With Indian corn at \$1.68 per bushel the food cost of producing 100 pounds of increase in weight is \$15 on the basis heretofore explained.

During normal times an abundant crop of Indian corn is followed by an increased production of pork, culminating in the following August and September when the spring crop of pigs begin to mature. This seesaw between the price of Indian corn and the price of pork has been going on for several generations and is perfectly well understood. Other factors, however, due to the unprecedented war demands, will doubtless bring about a disturbing element. What the net result will be no one can, of course, accurately foresee. It is, nevertheless, interesting to observe that there is a very direct relation between the demand for "khaki" and the price of wheat. The greatly enhanced price of wool will tend to hold back the marketing of mutton. This will cause an increased demand for other meats, thus holding up the price of Indian corn, oats, and barley, and hence tend to reduce the production of wheat. An increase in the price of wool tends to increase the price of mutton. The price of mutton tends to maintain the price of beef and pork. The price of beef and pork tends to maintain the price of corn and barley. The price of corn and barley tends to increase their acreage. Increased acreage in corn and barley tends to decrease the acreage in wheat. Any man who buys an extra suit of clothes inevitably tends to decrease the future supply of wheat for ourselves and our allies.

Taking the country as a whole, other grains can be substituted for barley as food for domestic animals. As food for our allies in

² For simplicity of statement, hogs are used in this discussion, although the same principles apply more or less fully to all other domestic animals, and particularly to such animal products as butter and eggs.

practice nothing can take the place of wheat. It is of the utmost importance that all reasonable effort be made to increase its production.

If every farmer puts wheat on 10 per cent of the acreage which he usually sows to barley, he will increase the acreage of wheat in California by 33 per cent. Some lands are now sown to barley because the lack of water or plant food, or both, make it difficult to raise wheat. Without doubt, it is better to continue chiefly to raise barley under such conditions. However, if the methods briefly outlined in this circular and more fully discussed in circulars on wheat by Gilmore and on fertilizers by Lipman are followed, most farmers who raise barley will be justified in putting 10 per cent of their grain acreage into wheat.

Even if the result is not wholly satisfactory the loss can not be great. A plentiful supply of wheat for our allies next year may be the decisive factor of this war. Every barley farmer can afford to take the slight risk involved.

The production of wheat may be increased in other ways than by the substitution of this crop for barley or other cereals. There are at least two ways open in California.

1. Use of new land not recently used for other purposes than grazing. On these new areas wheat may be raised by dry-land farming or where water is available irrigation may be used. Wheat has not been irrigated extensively in California because normally other crops, such as fruits, alfalfa, and sugar beets, have been more profitable under similar conditions.

Under present conditions wheat will bring a satisfactory gross return at a considerably smaller expense for labor than that used on many other crops. The only possible loss where conditions are favorable would be a possible lessening of the value of the capital invested. Wherever practicable, therefore, farmers should take up the growing of wheat under irrigation. Any poor stands of alfalfa may well be plowed up and put into wheat, not only from the standpoint of immediate return, but because of the improvement of these tracts for future seeding of alfalfa or other crops. In sections where the water table has risen it will be especially desirable, since wheat can be raised with less water than alfalfa. Wheat requires its water when the latter is not abundantly needed for other crops. Irrigation of wheat will thus increase the duty of water.

In certain sections the growing of wheat, barley, and oats has so far disappeared for any purpose other than grain hay that suitable

grain harvesting machinery no longer exists. In such cases community action is desirable.

The College of Agriculture of the University of California urges the farmers of the state to increase the wheat acreage under irrigation. In order to encourage the movement, it will send free of charge irrigation advisers into any community to give information concerning the most suitable methods where farmers, through lack of experience, feel the need of such information.

It has been found, after investigation, that under a number of irrigation systems in California there are considerable areas not now irrigated for one cause or another, which will be available for the application of water under reasonable terms. A portion of these areas will be adapted to grain production. It is possible to raise emergency crops on some of these lands without the usual expensive methods of levelling and checking. Practical advice will be offered on application at any time. Information concerning the location, ownership, and adaptability of the larger of these areas will also be given so far as it is available. The responsibility for all financial arrangements will rest entirely with the owners of the land or their agents and the parties interested.

It is believed that there are considerable areas of land which once raised grain but which have recently been used for grazing owing largely to economic conditions of the past, but upon which, at present prices, wheat would at least pay the cost of production. Unfortunately, on lands where the rainfall is less than fifteen inches satisfactory crops are not generally assured unless biennial cropping is practiced. Hence these lands cannot be used to the best advantage for the 1918 crop unless they were plowed in the fall of 1916 or the winter and spring of 1917. It is now not too early to begin to consider the 1919 crop on these lands.

2. There remains another method of increasing the production of wheat. It is the increase in the yield on existing acreage. It is perhaps the most effective method. There are four simple and relatively easily applied means of increasing the yield of wheat or barley per acre.

- (a) Better seed, including treatment against preventable diseases.
- (b) More thorough preparation of soil.
- (c) Greater care in seeding promptly when the proper time arrives. (Great losses unquestionably occur through delayed seeding.)
- (d) The application of fertilizers.

In the circular on wheat culture Gilmore gives a considerable amount of experimental data covering these factors. Emphasis is here placed upon the economical aspects of the use of chemical manures. California was once a great wheat state. Largely for economic reasons wheat raising has declined. There is nothing in the soil or climate of California to prevent as great a production of wheat as ever. This does not mean that certain areas in California

have not declined in fertility, but it means that they can be made as fertile as ever. It is merely a matter of economics.

The methods of increasing the yield of wheat per acre are known and the means are at hand. Will it pay, or should it be done even if it does not pay, are the questions to be determined. Fertilizer experiments have now been conducted for more than seventy-five years in England and for about half that period in the United States. The general results of all these investigations show that a given soil without fertilization will under cultivation soon come to a standard yield of grain, from which it will not vary greatly in one decade as compared with another. Curiously enough, this yield has been found for wheat to be, under widely varying conditions, about thirteen bushels per acre. Future investigations made under other soil and climatic conditions may change this figure to some extent.

It has also been found wherever "long time" experiments have been made that it is possible through the use of either natural or artificial manure to obtain a yield about two and one-half times as great as where no fertilizers are employed. Here again future studies under other conditions may change this result somewhat. These two figures, however, may be taken at present as the basis for a discussion on the economic use of fertilizers. All investigations show that an effective increase is not generally made by the occasional or periodical use of fertilizers, but is obtained when it is used in accordance with some consistent and well-planned system.

Investigations have demonstrated that if land is capable of raising thirty to forty bushels of wheat per acre without fertilizers, use of the latter will not cause a material increase. If the land is fertile enough to produce a large crop without fertilizers their application may not increase the yield. They may, however, prevent a decline in the yield of subsequent crops. Various experiments have not only shown that this actually happens, but that in the long run it pays just as well to prevent a decline in yield as to increase the yield after the decline has taken place. This is seldom, if ever, done in practice and perhaps is not likely to be, since most persons are more concerned in immediate than in future profits.

Gilmore and Lipman have discussed the technical side of the problem in recent circulars which are available on application. It will be obvious to any candid mind that under present conditions no guarantee can be made as to the net result of any widely extended programme of fertilization applied either to wheat or to barley. The College of Agriculture, however, believes that there are sufficient data available to warrant it urging the farmers of California to take certain risks. Considering the state as a whole, it feels reasonably safe in saying that by the use of 100 pounds of sulphate of ammonia, 125 pounds of nitrate of soda, or the equivalent amount of nitrogen in some other carrier, an increase can be made of six bushels of wheat or ten bushels of barley per acre, provided it is applied to land adapted through climatic and soil conditions to the crop in question.

Under any programme that can be devised it is probable that one-third the farmers may find the use of fertilizer profitable, one-

third may break about even, and one-third may suffer some financial loss, so far as the 1918 crop is concerned. It is possible that later crops may more than make up the difference. Naturally lands which under suitable climatic and cultural conditions already give maximum returns will not be benefited. Likewise, lands which are unsuited because of the lack of rainfall, or by reason of physical or other conditions, for the production of cereals can not be made productive by the use of fertilizers.

This matter has been carefully taken up with our farm advisers who are now, or will soon be stationed in most counties producing considerable areas of wheat or barley. Through them and other members of its staff the college is able to offer such advice as it is capable of giving without charge. No one can guarantee what the results will be to any given individual, but it will be possible to prevent many mistakes. It is much better to ask advice before the fertilizer is applied than after the results have been found to be unsatisfactory. There is no doubt that the 1918 crop of wheat can be much increased on a basis which, as a whole, will be economic although individual losses will necessarily occur.

To recapitulate: California's share in the billion bushel wheat crop can be accomplished either by increased acreage or increased yield per acre or both. Increased acreage may be brought about by substituting wheat for barley or poor stands of alfalfa, by using areas recently brought under irrigation or by plowing and seeding idle lands. Increased yields may be obtained primarily by timely seeding, good seed, and judicious use of fertilizers.

Farmers of California, you are, taken as a whole, fairly prosperous. Part of your prosperity is due to this dreadful crisis. To increase the yield of all staple food products is just as important and just as patriotic as to subscribe to Liberty Bonds or to aid the Red Cross. Why not take the chance? The sooner this country and her allies have all the commodities that it and they need, the earlier this war will end, and the fewer of our sons will be killed in battle. The risk is not too great for you to take.